

CLAIMS

Sub A27 1. An Integrated Heat Spreader / Integrated Stiffener (IHS/IS) to provide stiffening support to a substrate.

2. An IHS/IS as claimed in claim 1, arranged to provide stiffening support to one of a thin-core and coreless substrate of a ceramic, flex, and an integrated circuit printed circuit board (IC-PCB) carrier package.

3. An IHS/IS as claimed in claim 2, the package being one of a pinned grid array (PGA), and a ball grid array (BGA) carrier package.

4. An IHS/IS as claimed in claim 2, the package being one of a flip chip pin grid array (FC-PGA), and a flip chip ball grid array (FC-BGA) carrier package.

Sub A27 5. An IHS/IS as claimed in claim 1, the IHS/IS substantially made of a thermally conductive material, formed as one of a molded, stamped, etched, extruded and deposited IHS/IS, and is capable of withstanding temperatures of at least normal IC operation.

6. An IHS/IS as claimed in claim 1, the IHS/IS having an integrated stiffener extension which is substantially planar stiffener for mounting to a substantially planar die-side surface of the substrate.

7. An IHS/IS as claimed in claim 1, the IHS/IS having an internal cavity therein to provide clearance for at least one of a die, underfill, and die side component (DSC).

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8. An IHS/IS as claimed in claim 1, the IHS/IS being attached in multiple parts.

9. An IHS/IS as claimed in claim 1, having an above-substrate cavity-height when mounted, which is one of equal to, and greater than, an above-substrate height, of a mounted IC-die.

10. An IHS/IS as claimed in claim 1, the IHS/IS having a bottom surface when mounted, which is substantially co-planar with, when mounted, a top surface of a combination of an IC-die with interface material.

11. An IHS/IS as claimed in claim 1, the IHS/IS being adapted to support a heat sink.

12. An IHS/IS as claimed in claim 1, the IHS/IS having an integrated cooling structure.

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13. An IHS/IS as claimed in claim 1, the IHS/IS being electrically connected to the substrate.

14. An IHS/IS as claimed in claim 1, the IHS/IS being electrically insulated from the substrate.
15. An IHS/IS as claimed in claim 1, the integrated stiffener portion being an edge/ring stiffener for mounting to minor-planar side surfaces of the substrate.
16. An IHS/IS as claimed in claim 1, the integrated stiffener portion being an edge/ring stiffener having a non-flat cross section adapted to mate with side surfaces of the substrate.
17. An IHS/IS as claimed in claim 1, the integrated stiffener portion being an edge/ring stiffener where portion of the edge/ring stiffener is adapted to be pre-attached to the substrate by an carrier package manufacturer.
18. A carrier package comprising:  
one of a thin-core and coreless substrate of one of a ceramic, a flex, and an IC-PCB; and  
an IHS/IS arranged to provide stiffening support mounted to said substrate.
19. A carrier package as claimed in claim 18, the package being one of a pinned grid array (PGA), and a ball grid array (BGA) carrier package.

20. A carrier package as claimed in claim 18, the package being one of a flip chip pin grid array (FC-PGA), and a flip chip ball grid array (FC-BGA) carrier package.

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21. A carrier package as claimed in claim 18, the IHS/IS substantially made of a thermally conductive material, formed as one of a molded, stamped, etched, extruded and deposited IHS/IS, and is capable of withstanding temperatures of at least normal IC operation.

22. A carrier package as claimed in claim 18, the IHS/IS having an integrated stiffener extension which is substantially planar for mounting to a substantially planar die-side surface of the substrate.

23. A carrier package as claimed in claim 18, the IHS/IS having an internal cavity therein to provide clearance for at least one of a die, underfill, and die side component (DSC).

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24. A carrier package as claimed in claim 18, the IHS/IS being attached in multiple parts.

25. A carrier package as claimed in claim 18, the IHS/IS having an above-substrate cavity height when mounted, which is one of equal to, and greater than, an above-substrate plane-height, when mounted of an IC-die.

26. A carrier package as claimed in claim 18, the IHS/IS having a bottom surface when mounted, which is substantially co-planar with, when mounted, a top surface of a combination of an IC-die with interface material.

27. A carrier package as claimed in claim 18, the IHS/IS being adapted to support a heat sink.

28. A carrier package as claimed in claim 18, the IHS/IS having an integrated cooling structure.

29. A carrier package as claimed in claim 18, the IHS/IS being electrically connected to the substrate.

30. A carrier package as claimed in claim 18, the IHS/IS being electrically insulated from the substrate.

31. A carrier package as claimed in claim 18, the IHS/IS having integrated stiffener portion being an edge/ring stiffener for mounting to minor-planar side surfaces of the substrate.

32. A carrier package as claimed in claim 18, the IHS/IS having integrated stiffener portion being an edge/ring stiffener having a non-flat cross section, adapted to mate with side surfaces of the substrate.

33. A carrier package as claimed in claim 18, the IHS/IS having integrated stiffener portion being an edge/ring stiffener where portion of the edge/ring stiffener is adapted to be pre-attached to the substrate by a carrier package manufacturer.

34. A packaged integrated circuit (IC) comprising:  
one of a ceramic, flex, and an IC-PCB carrier package including one of a thin-core and coreless substrate; and  
an IHS/IS arranged to provide stiffening support mounted to said substrate.

35. A packaged IC as claimed in claim 34, the carrier package being one of a pin grid array (PGA), and a ball grid array (FC-BGA) carrier package.

36. A packaged IC as claimed in claim 34, the carrier package being one of a flip chip pin grid array (FC-PGA), and a flip chip ball grid array (FC-BGA) carrier package.

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37. A packaged IC as claimed in claim 34, where the IHS/IS is substantially made of a thermally conductive material, formed as one of a molded, stamped, etched, extruded and deposited IHS/IS, and is capable of withstanding temperatures of at least normal IC operation.

38. A packaged IC as claimed in claim 34, the IHS/IS having an integrated stiffener extensions which is substantially planar for mounting to a substantially planar die-side major planar surface of the substrate.

39. A packaged IC as claimed in claim 34, the IHS/IS having an internal cavity therein to provide clearance for at least one of a die, underfill, die-side component (DSC).

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40. A packaged IC as claimed in claim 34, the IHS/IS being attached in multiple parts.

41. A packaged IC as claimed in claim 34, the IHS/IS having an above-substrate cavity-height when mounted, which is one of equal to, and greater than, an above-substrate height, of a mounted IC-die.

42. A packaged IC as claimed in claim 34, the IHS/IS having a bottom surface when mounted, which is substantially co-planar with, when mounted, a top surface of a combination of an IC-die with interface material.

43. A packaged IC as claimed in claim 34, the IHS/IS being adapted to support a heat sink.

44. A packaged IC as claimed in claim 34, the IHS/IS having an integrated cooling structure.

45. A packaged IC as claimed in claim 34, the IHS/IS being electrically connected to the substrate.

46. A packaged IC as claimed in claim 34, the IHS/IS being electrically insulated from the substrate.

47. A packaged IC as claimed in claim 34, the IHS/IS with integrated stiffener portion being an edge/ring stiffener for mounting to minor-planar side surfaces of the substrate.

48. A packaged IC as claimed in claim 34, the IHS/IS with integrated stiffener portion being an edge/ring stiffener having a non-flat cross section adapted to mate with side surfaces of the substrate.

49. A packaged IC as claimed in claim 34, the IHS/IS Stiffener with the integrated stiffener portion being an edge/ring stiffener where portion of the edge stiffener is adapted to be pre-attached to the substrate by an IC-PCB carrier package manufacturer.